To

FOREMOST HOMES HAWAII, LTD.

Kailua, Hawaii

on

ADDENDUM TO SOILS INVESTIGATION REPORT

DATED DECEMBER, 1972

for

ENCHANTED LAKES SUBDIVISION, UNIT 8-B-2

KUKILAKILA CLUSTER HOMES, PHASE I

BUILDING 13

by

GJ HAWAII, LTD.

807 Ilaniwai Street

Honolulu, Hawaii 96813

OCTOBER 1975

GJH

File R-0102-H1
October 23, 1975

TABLE OF CONTENTS

APPENDIX

GJ HAWAII, LTD.
807 ILANIWAI STREET • HONOLULU, HAWAII 96813 • PHONE (808) 523-1661
Consultants in the Applied Earth Sciences

File R-0102-H1
October 23, 1975

Foremost-HPI Joint Venture
c/o Foremost Homes Hawaii, Ltd.
146 Hekili Street
Kailua, Hawaii 96734

Attention: Mr. Harvey Gerwig

Subject: Enchanted Lakes Subdivision, Unit 8-B-2
Kukilakila Cluster Homes, Phase I
Building 13
ADDENDUM TO SOILS INVESTIGATION REPORT
DATED DECEMBER, 1972

Gentlemen:

Transmitted herewith are the results of our additional Soils Investigation for the proposed relocation of Building 13 in the Kukilakila Cluster Homes Subdivision, Phase I, located in Kailua, Oahu, Hawaii. This report has been prepared as an Addendum to the Soils Investigation Report on the subject property submitted in December, 1972, and is directed specifically toward the recently proposed location of Building 13. The present work was completed through the authorization of Mr. Harvey Gerwig of Foremost Homes Hawaii, Ltd. on October 7, 1975.

Although a formal Soils Investigation was completed in December, 1972 for the proposed area of both Phases I and II of this pro-

ject, it was noted at that time that certain areas, and in particular the original location of Building 13, were not suitable for construction. It was subsequently recommended that due to the instability of the subsurface soils and the continual subsidence of the overlying fill, a series of settlement gauges be installed and monitored to determine the degree and rate of settlement in these areas.

As the analysis of the settlement readings in the vicinity of Building 13 over the past 2½ years has not indicated an appreciable reduction in the rate of settlement, it was decided that Building 13 be moved to the location proposed in Figure 1, Site Plan and Boring Locations. The present investigation has been undertaken to evaluate the subsurface soil conditions in this area in regard to its stability and its suitability to receive building improvements. Pertinent information derived in the 1972 investigation has been incorporated into and utilized in conjunction with, the recently obtained data in the preparation of this report. The Boring numbers have been maintained for purposes of clarity and continuity.

Presently available information indicates that certain modifications have been incorporated into the design of Building 13 as part of its relocation. Although the basic construction has not changed, space limitations have dictated a smaller

building layout identical to the adjacent unit, Building 12, rather than the 8-unit design originally anticipated.

Existing Site Conditions

At the present time, the proposed site is a planned "open space" area flanked by the partially completed service roads designated as Roads "B" and "B-1" on the northern side of Enchanted Lakes. Grading has already been accomplished, and utilities and other subsurface appurtenances have also been installed in the area. Landscaping has been completed and large boulders have been placed in this area for aesthetic reasons. Scattered weeds have re-established themselves along the edge of the roads.

The topography is generally flat throughout the proposed building area but slopes gently toward the lake from the edge of the service road "B-2". The approximate elevation ranges from 11 to 14 feet above mean sea level.

Subsurface Exploration

An additional test boring (Boring 29) was drilled and sampled on October 8 and 9, 1975 at the approximate location shown in Figure 1. The boring was extended to a depth of 52.0 feet below the existing ground surface utilizing a truck-mounted Mobil B-40L drilling rig advancing 4-inch continuous flight

augers or steel drilling casing.

Relatively undisturbed samples of the subsurface soils were recovered at selected depths utilizing a 3.0 inch O.D. split-spoon sampler. The sampler was driven into the soil mass under the action of a 140 pound hammer freely falling 30 inches. The number of blows required to advance the sampler 12 inches was recorded as the Penetration Resistance and is shown in the Boring Logs.

All drilling and sampling operations were conducted under the supervision of a GJ Hawaii, Ltd. Engineer who visually classified the subsurface soils encountered and maintained the Boring Logs.

Laboratory Testing

Appropriate laboratory tests were performed on selected samples of the subsurface soils to determine their relevant engineering parameters including moisture-density, compressibility, and direct shear. Atterberg limits tests were also conducted to aid in the classification of these soils.

The results of these tests are summarized in Tables I and II in the Appendix.

Subsurface Soil Conditions

In general, the site is underlain by 13 to 22 feet of previously placed fill material. Although the composition of the fill varies from reddish brown imported residual Silty Clays to dredged lake material, the relative compaction of the materials appears adequate. Throughout the major portion of the site, the fill material is immediately underlain by 5 to 6 feet of soft to medium stiff marine Clays and organic Silts, followed by loose lagoon-type deposits. These deposits are composed of fine Sandy Silts with many finger Coral fragments and extend to depths of 42 to 51 feet below the existing ground surface. This is immediately underlain by 19 to 32 feet of soft to medium stiff marine Clays and silts followed by residual decomposed rock.

Along the southern corner of the proposed building area, and specifically in the vicinity of Boring 17, the fill material is underlain by marine Clays and silts with relatively fewer Coral fragments than was encountered in the other borings. In general, it appears that a zone of transition exists in this vicinity whereby relatively unmixed marine clays, silts, and other fine sedimentary material exist along the lakefront to the south, while coarser Coralline sediments have been deposited under the major portion of the proposed building area north of the transition zone.

Static groundwater was encountered at 12 to 18 feet below the existing ground surface.

Conclusions

1. We believe the present site can be adequately developed to support the proposed building provided the recommendations of this report are followed.

2. Our recent Soils Investigation has confirmed the presence of compressible lagoon-type marine sediments immediately underlying the existing fill material. However, we believe that the potential settlement problems can be minimized by modifying the foundations of the structure.

General

3. Prior to the re-grading of the site, the presently existing boulders, slabs, and concrete curbs should be removed and wasted off the site. Existing utilities should be relocated and removed from the proposed building area.

4. After clearing operations have been completed, stripping should commence to remove the organically contaminated near-surface soils. Although the exact depth of stripping can only be established in the field during construction, it is likely that 4 to 6 inches will suffice. The contaminated soil should be stockpiled for future use as topsoil in planting areas.

Grading

5. Following the completion of clearing and stripping operations, grading should commence to generate the building pad for the proposed structure. The building pad should extend no less than 5 feet beyond the external perimeter of the building.

6. Areas designated to receive foundation units or engineered fill should be compacted to 90 percent relative compaction as determined by Laboratory Compaction Test ASTM D-1557-70 for a minimum depth of 12 inches.

7. It is recommended that filling operations be minimized to prevent excessive overburden stresses to the underlying soft materials. Should small amounts (less than 2 feet) of engineered fill be necessary to attain final design grade elevations, the fill material should be placed in 6-to-8-inch maximum thick lifts and compacted to 90 percent relative compaction as determined by the above referenced test.

8. Vibratory compaction equipment should not be utilized on this project as the induced vibrations can cause a reduction in stability and increased settlements in the weaker strata below.

9. Should localized soft spots be encountered, these should

be over-excavated, and the then existing void backfilled with compacted fill.

10. It is anticipated that numerous utilities will be re-routed and/or removed during the grading operations. The exposed excavations created through these operations should be properly backfilled and compacted to 90 percent relative compaction as determined by Laboratory Compaction Test ASTM D1557-70. Care should be taken to restrict the thickness of the lifts to 4 to 6 inches to assure uniform compaction.

11. Should import fill be utilized on this project, a sample of the proposed fill material should be submitted to the Project Soils Engineer no less than four working days prior to its intended job-site delivery to allow adequate time for testing, evaluation, and approval.

12. The Soils Engineer or his representative should inspect all clearing, stripping, and grading operations.

Foundations

13. We believe that the most appropriate foundation system for use on this building would be additionally reinforced continuous perimeter footings. Although other foundation systems are available, we believe that the recommended system will prove most economical and will perform satisfactorily.

14. The continuous footings should be embedded no less than 12 inches below the top of the nearest adjacent subgrade (exclusive of topsoil) and should have a base width of no less than 12 inches and no greater than 24 inches.

15. Due to the proximity of the building to the transition zone, it is likely that any settlement which occurs will be differential in nature. Greater than normal steel reinforcement should be provided as directed by the Project Structural Engineer to provide foundations similar in design to the foundations for Buildings 1, 2, 3, 9 and 10.

16. Provisions for "mud jacking" should be incorporated into the design of the foundations in the southern corner in the event that excessive differential settlement occurs beneath the footings. This may occur in the southern corner of the building area near the transition zone. The extent of the compressive soil could not be completely established in this area without an excessive number of borings.

17. Should localized soft spots be encountered during trenching operations for the footings, these areas should be over-excavated and backfilled with a compacted granular material.

18. The Project Soils Engineer or his representative should inspect all footing excavations prior to the pouring of the

concrete.

19. Under these conditions, a design soil bearing capacity of 2000 p.s.f. may be utilized. This value may be increased by one-third for short-term seismic and wind loadings.

Concrete Slabs-On-Grade

20. The exposed soil under all concrete slabs-on-grade should be compacted to 90 percent relative compaction as determined by Laboratory Compaction Test ASTM D1557-70.

21. The compacted soil should be overlain by 4 inches of No. 4 crushed Basalt gravel approximately 3/8 inches in diameter with the majority of the material the same size. The Basalt gravel should be clean and free of fines (no more than 4 percent passing the No. 200 sieve).

22. A visqueen membrane should be placed between the concrete slab and the gravel as a moisture barrier.

23. Concrete slabs-on-grade should be structurally integrated into the footings.

24. Steel reinforcement of all concrete slabs-on-grade should be provided as directed by the Project Structural Engineer.

Miscellaneous

25. Positive drainage provisions should be incorporated into the design of the project to preclude the ponding of water adjacent to or beneath the building or its foundation.

26. Provisions should be made for the periodic monitoring (every 4 to 6 months) of the settlement of underlying fill to determine the necessity of "mud jacking" below the foundation.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations for this report are based upon the assumption that the soil conditions do not deviate from those observed. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the present time, GJ Hawaii, Ltd. should be notified so that supplemental recommendations can be given.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to assure that the information and recommendations contained herein are called to the attention of the Architect and Engineers for the project and incorporated into the plans, and that the necessary steps are taken to see that the Contractors and Subcontractors carry out such recommendations in the field.

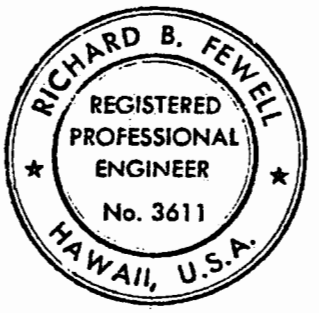
3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of

this report may be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of one year.

Respectfully submitted,

GJ HAWAII, LTD.

Richard B. Fewell, P.E.
President



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Copies: 5 to Foremost-HPI Joint Venture
c/o Foremost Homes Hawaii, Ltd.
(Attn: H. Gerwig)

File R-0102-H1
October 23, 1975

APPENDIX

Site Plan and Boring Locations

Test Boring Logs

Consolidation Curves

Summary of Laboratory Test Results

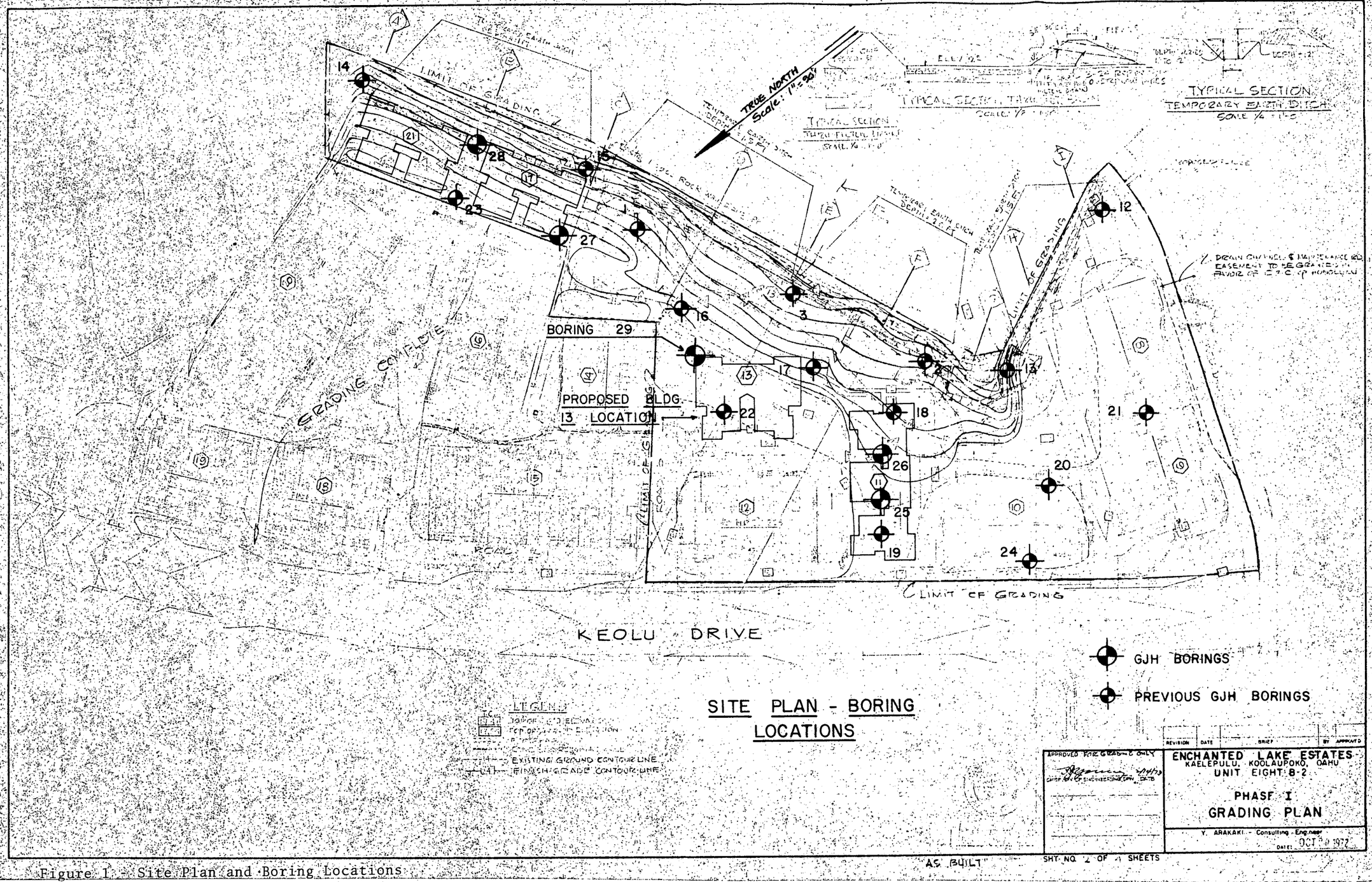

Figure 1 - Site Plan and Boring Locations

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 3		
0				FILL - Varied in color, composition, density and moisture content		
5				▼		
10			11			
15						
				BOTTOM OF FILL		
20				Light gray Silty CLAY, very soft, wet (CL)		
	3-1		2		69.2	53.6
25						
28						

Figure 2 - Test Boring Log 3

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
28				Boring No. 3 (cont'd)		
30	3-2		3	Light gray Silty CLAY, very soft, wet. (Torvane = 170 p.s.f.)	65.1	59.0
45	3-3		4	(Torvane = 200 p.s.f.)	71.3	44.6
55				Mottled gray/green Silty CLAY with traces of Sand and Gravel, very stiff, wet (CL)		
56						

Figure 2a - Test Boring Log 3 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 3 (cont'd)		
56				Mottled gray/green Silty CLAY		
60	3-4		15	(Direct Shear: ϕ = 19-1/2°, c= 150 p.s.f)	73,8	48.1
65				Mottled brown/tan Silty CLAY with Gravel and Rock fragments, hard, wet (CL)		
70	3-5		54		50.6	32.2
75						
80				(at 81', material becomes brown in color with cobbles - drilling very stiff)		
84						

Figure 2b - Test Boring Log 3 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 3 (cont'd)		
84				Brown Silty CLAY with Gravel and rock fragments.		
85						
90				ROCK		
				Decomposed ROCK		
95				ROCK		
98				Boring Terminated at 98'		

Figure 2c - Test Boring Log 3 (Continued)

File R-0102-H1
October 23, 1975

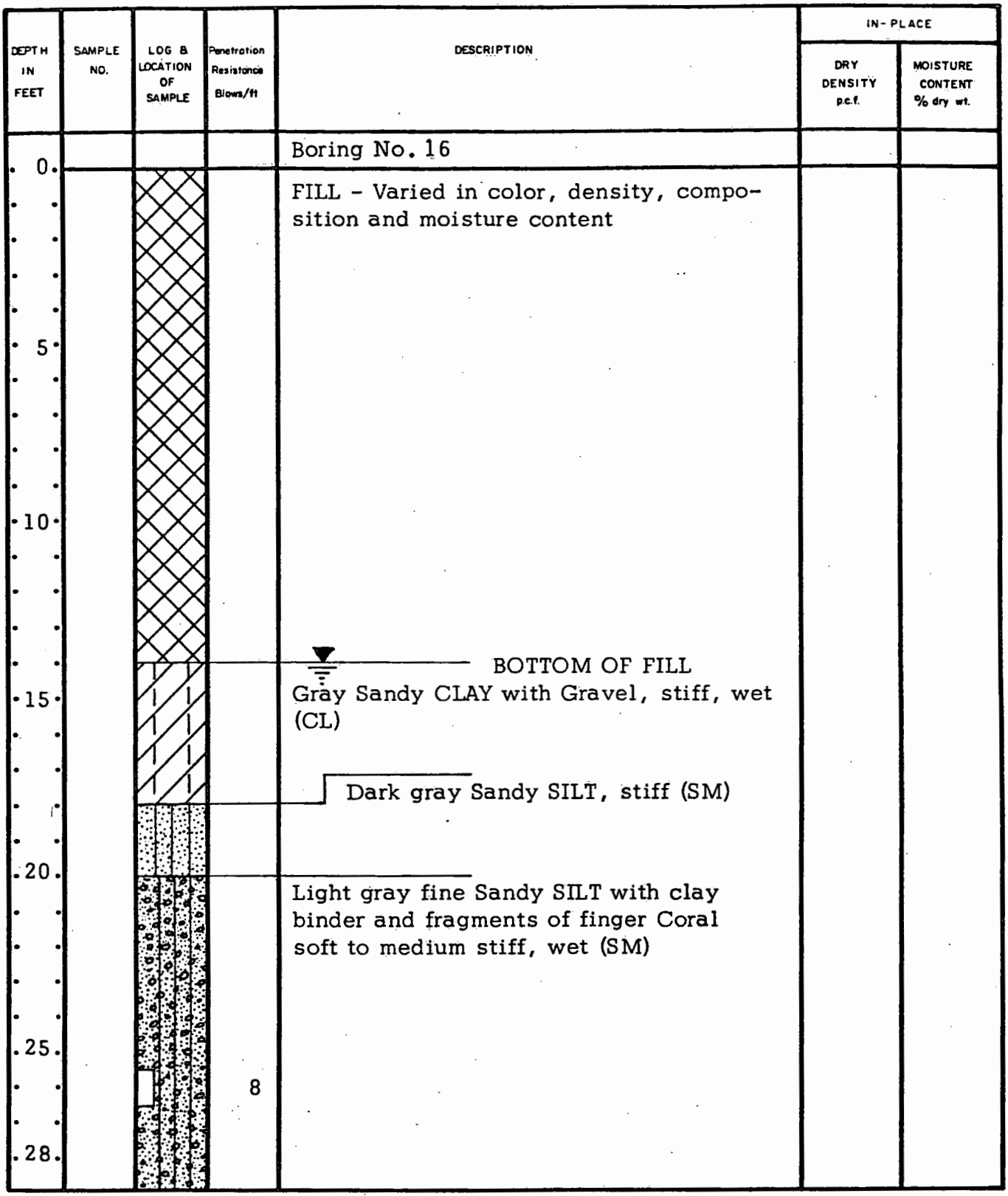

Figure 3 - Test Boring Log 16

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 16 (cont'd)		
28				Light gray fine Sandy SILT		
30			8			
35						
40			8	(at 41', grading with more clay)		
	16-1		6			
45				Gray Silty Clay, soft, wet (CL)		
50	16-2		4		66.1	55.2
55						
56						

Figure 3a - Test Boring Log 16 (Continued)

File R-0102-H1
October 23, 1975

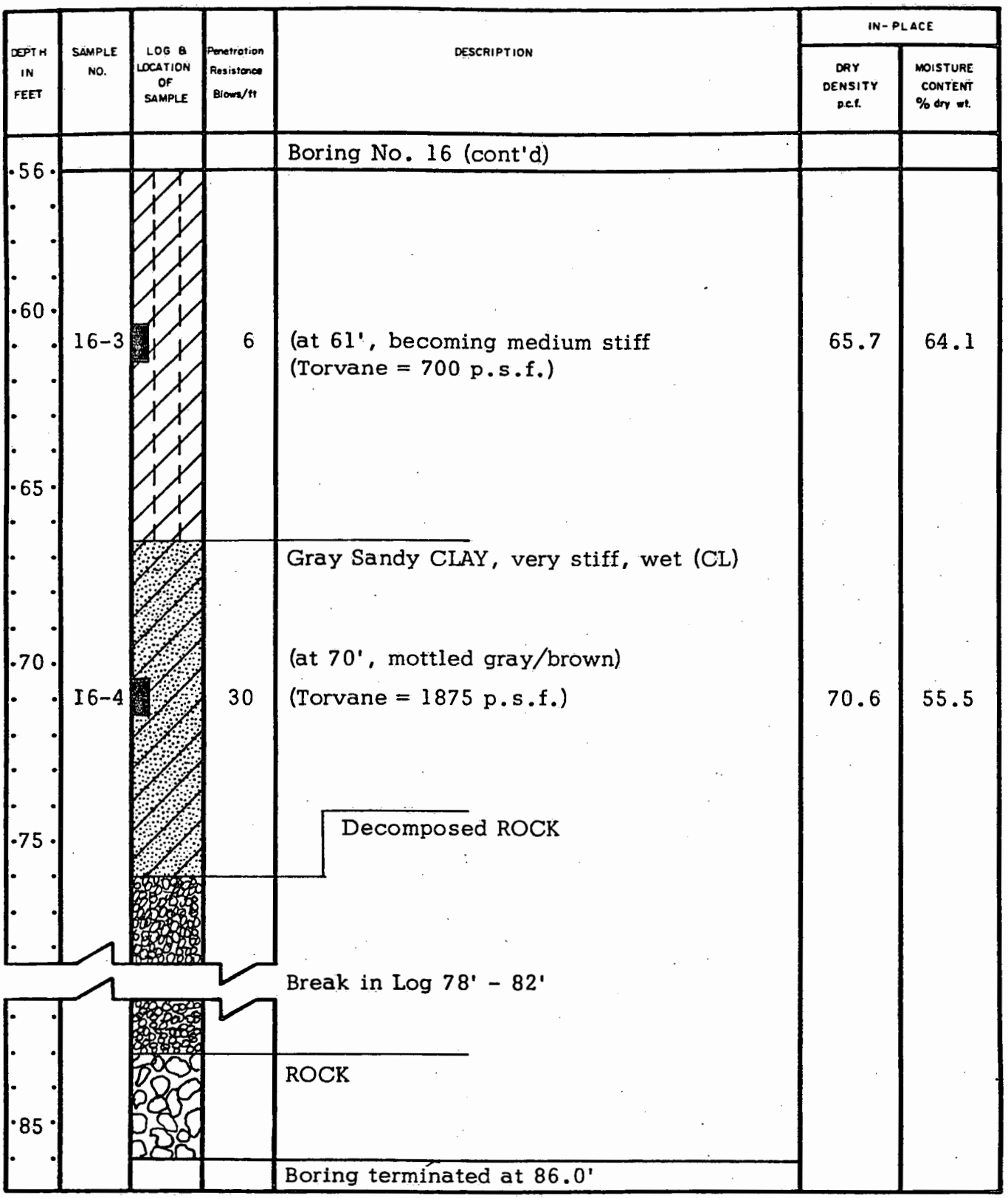

Figure 3b - Test Boring Log 16 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 17		
0				FILL - Varied in color, density, composition and moisture content		
5						
10						
15						
20						
				BOTTOM OF FILL		
25				Gray Silty CLAY with Sand and Gravel, stiff (CL)		
28				(at 28', Coral fragments in Clay)		

Figure 4 - Test Boring Log 17

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 17 (cont'd)		
28				Gray Silty CLAY with Coral fragments		
30						
35			9			
	17-1		11	Light gray Sandy CLAY with Coral fragments, stiff, wet (CL)		
40						
	17-2		5	Light gray Silty CLAY, medium stiff, wet (CL) (US.S = 4370 p.s.f.)	72.3	50.0
43				(at 51', gray in color)		
				Break in Log 43' - 59'		
59						
60						
	17-3		7	(at 61', medium stiff) (Torvane = 560 p.s.f.)	67.1	55.2
				Break in Log 63' - 76' (at 72', dark gray with small organics)		
				Dark gray Silty CLAY with small organics, very stiff, wet (CL)		
79	17-4		38	(Torvane = 1050 p.s.f.)	58.8	66.9
				Boring terminated at 79.5'		

Figure 4a - Test Boring Log 17 (Continued)

File R-0102-H1
October 23, 1975

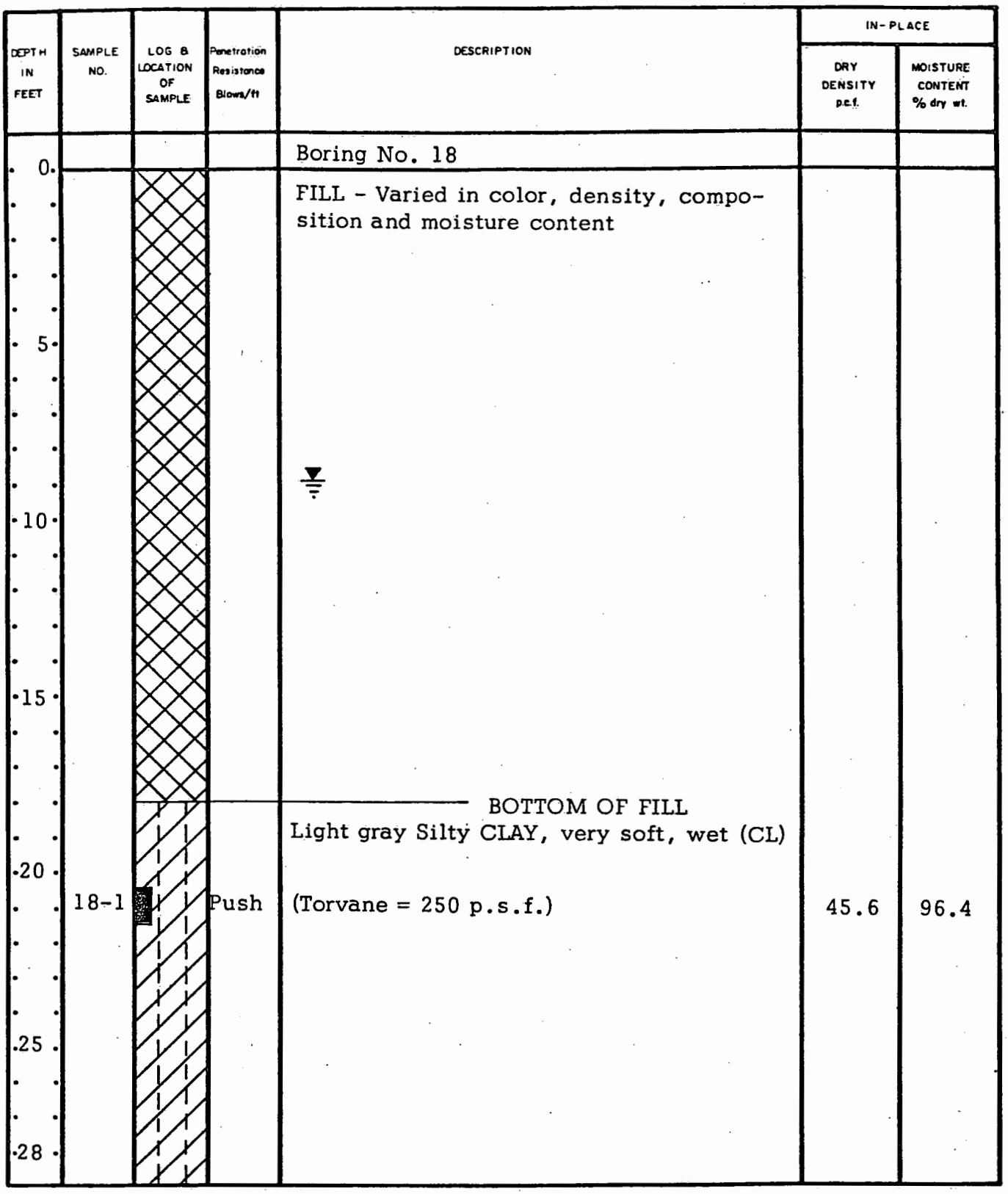

Figure 5 - Test Boring Log 18

File R-0102-H1
October 23, 1975

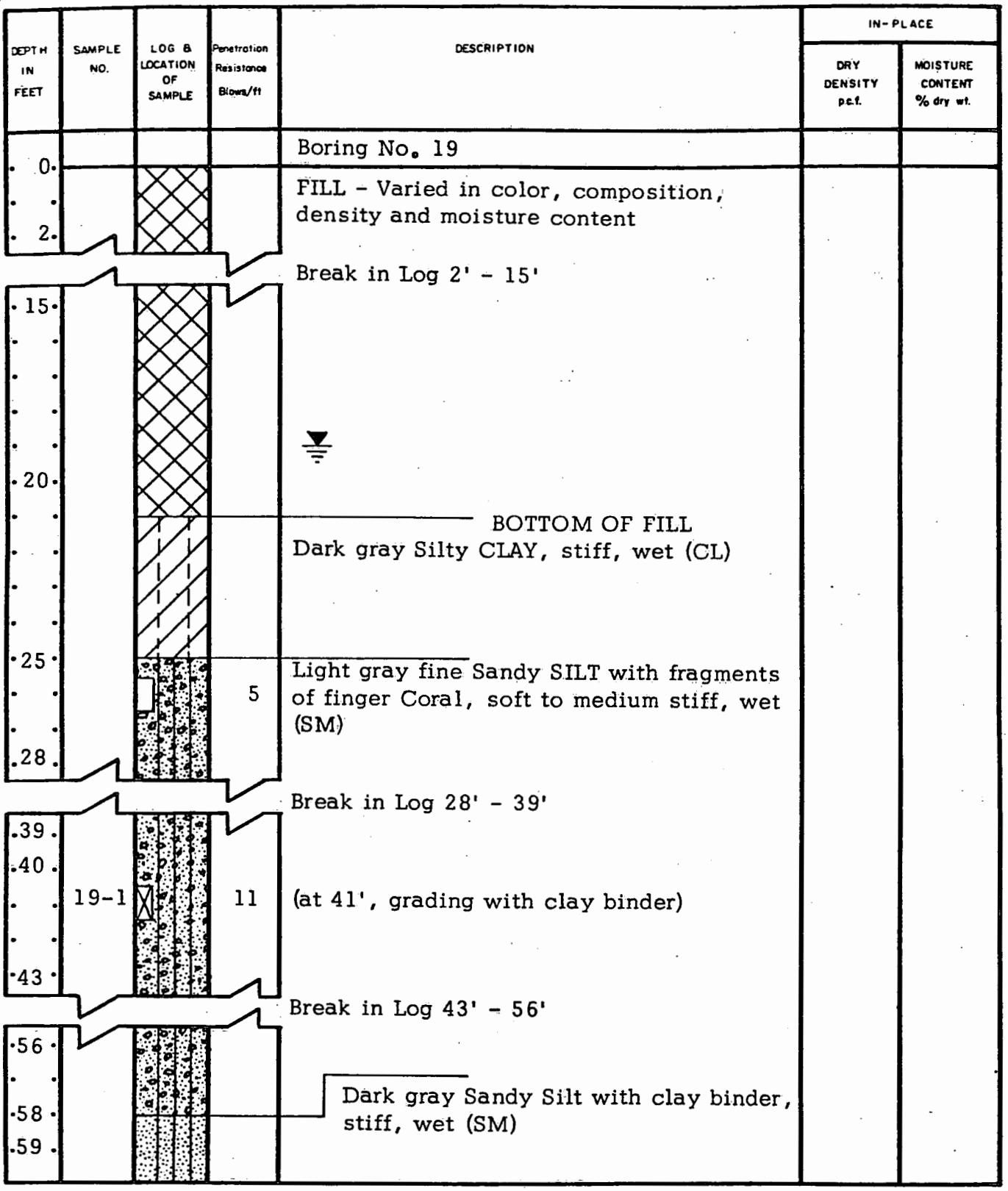

Figure 6 - Test Boring Log 19

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 18 (cont'd)		
28				Light gray Silty CLAY, very soft, wet		
30	18-2		1	(Torvane = 270 p.s.f.)	59.4	67.6
33						
				Break in Log 33' - 39'		
39						
40	18-3		2		64.6	59.3
43						
				Break in Log 43' - 50'		
50						
				Cark gray Silty CLAY, soft, wet (CL)		
55	18-4		4		69.1	56.7
58						
				Break in Log 58' - 67'		
67						
				Gray Clayey SILT with weathered rock, very stiff, wet		
70	18-5		31	(Direct Shear: $\phi = 39^{\circ}$, c = 350 p.s.f.)	65.3	60.5
				Boring terminated at 71.5'		

Figure 5a - Test Boring Log 18 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 19 (Cont'd)		
59				Dark gray Sandy SILT		
60				(at 63', brown in color)		
65						
70				Boring terminated at 70.0'		

Figure 6a - Test Boring Log 19 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 22		
0				FILL - Varied in color, density composition, and moisture content		
10	22-1		11	(Torvane = 1750 p.s.f.)	52.8	67.6
20				BOTTOM OF FILL		
25	22-2		6	Light gray fine Sandy SILT with fragments of finger coral and slight Clay binder, medium stiff, wet (SM)		
28						

Figure 7 - Test Boring Log 22

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 22 (cont'd)		
29				Light gray fine Sandy SILT with coral		
				Break in Log 29' - 49'		
49						
50				Dark gray Clayey SILT, medium stiff, wet (MH)		
55						
60						
	22-3		8	(Unconfined Shear Strength = 4310 p.s.f.)	72.7	50.0
65				(at 66', grading with Gravel)		
70						
	22-4		45	Greenish-gray decomposed ROCK - very stiff	112.0	19.6
74						

Figure 7a - Test Boring Log 22 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
74				Boring No. 22 (cont'd)		
75				Break in Log 75' - 88'		
88						
90				ROCK		
92				Boring terminated at 92.0'		

Figure 7b - Test Boring Log 22 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 25		
0						
	25 - 1		27	FILL Brown/reddish brown Silty CLAY with many decomposed and partially decomposed mottled pebbles and cobbles, hard, wet (CL-CH)		
5				(At 5.0', moisture increasing)		
	25 - 2		22			
10				Bottom of FILL		
	25 - 3		17	Dark grey Silty CLAY/Clayey SILT with numerous finger coral fragments, some Basalt fragments and traces of shells and fine Sand, very stiff, saturated (CH) (At 14.0', boulder encountered) NX Core: 1.0' run, 60% recovery	93.0	21.4
15						
20	25 - 4		7	Grey Silty CLAY with streaks of brown and some brown partially decomposed Gravel, Sand, shells, organics and streaks of peat, soft, saturated (OH)		
25	25 - 5		4	Light greenish grey fine Sandy SILT with Clay binder and finger coral fragments and shells, soft, saturated (ML)		
28						

Figure 8 - Test Boring Log 25

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 25 (Continued)		
28				Light greenish grey fine Sandy SILT with Clay binder and finger coral fragments and shells, soft, saturated (ML)		
30	25 - 6		7	(At 30.0', grading to loose to medium dense with more coral fragments		
35	25 - 7		13			
40	25 - 8		9			
45	25 - 9		7	Greenish grey Silty CLAY with traces of fine Sand and shells and organics, stiff, saturated (CL-CH)		
50	25-10		7	(At 51.0', grading with less Sand and shells)		
55	25-11		6			

Figure 8a - Test Boring Log 25 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 25 (Continued)		
56.				(At 56.0', grading to dark grey Sandy Silty CLAY with traces of finger coral, stiff, saturated (CL)		
60.	25-12		10			
65.	25-13		10	Dark grey/black Silty CLAY with shells and traces of organics, stiff, saturated (CH)		
70.	25-14		21	(At 70.0', grading to blue/grey with decomposed rock fragments)	69.4	52.3
75.	25-15		25	Orange/brown Clayey SILT with brown and yellow decomposed rock and traces of organics, hard, saturated (ML) (DECOMPOSED ROCK)		
80.	25-16		39			
84.						

Figure 8b - Test Boring Log 25 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 25 (Continued)		
85	25-17	10/	39	Orange/brown Clayey SILT with decomposed rock and organics, hard, (DECOMPOSED ROCK) saturated (ML)		
				Maroon/grey fractured BASALT with numerous Calcite crystals, dense NX Core: 5.0' run, 100% recovery		
90				NX Core: 5.0' run, 100% recovery		
95				Brown Silty CLAY with Gravel and grey and orange mottling (DECOMPOSED ROCK) hard, saturated		
				NX Core: 5.0' run, 70% recovery		
100				Boring terminated at 100.0'		

Figure 8c - Test Boring Log 25 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 26		
0	26 - 1		29	FILL Reddish brown Silty CLAY with mottled decomposed pebbles and cobbles and some small boulders, hard, wet (CL-CH)	84.0	29.6
5	26 - 2		19	(At 5.0', grading to very stiff) (At 5.5', seam of red Clayey SILT with white leaching and partially decomposed cobbles)		
				(At 7.5', boulder encountered) FILL Grey Silty CLAY with Gravel, cobbles and boulders and traces of brown Clay, stiff, very wet (CH)		
10	26 - 3		16	(At 9.0', small boulder encountered) FILL Brown Clayey SILT with white leaching and cobbles, Gravel, and small boulders, stiff, saturated (ML)		
15				(At 14.5', boulder encountered)		
	26 - 4		13*	Brown GRAVEL with Silt binder, medium dense, saturated (GM)		
20	26 - 5		10			
25	26 - 6		26	Bottom of FILL		
				Grey/green Sandy Silty CLAY with numerous shells, medium stiff, saturated (CL)		
28						

Figure 9 - Test Boring Log 26

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 26 (Continued)		
28				Grey/green Sandy Silty CLAY with numerous shells, medium stiff, saturated (CL)		
30	26 - 7		7			
	26 - 8		10			
35				(At 35.0', grading with some finger coral fragments)		
	26 - 9		11			
40				(At 40.0', grading with many finger coral fragments and a Silty CLAY binder)		
	26-10		12			
45				(At 45.0', grading to medium stiff to stiff without finger coral, very plastic (CH)		
	26-11		6		76.1	46.8
50						
	26-12		6			
55						
	26-13		6		71.4	50.6

Figure 9a - Test Boring Log 26 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
				Boring No. 26 (Continued)		
56				Dark green/grey fine Sandy Clayey SILT with traces of shells, medium stiff to stiff (M)		
60	26-14		7			
65				(At 65.0', grading with organics)		
	26-15		12	Dark brown/black organic Clayey SILT with organics and shells, very stiff, saturated (OL)		
70	26-16		14	(At 70.0', cobble encountered)	80.0	41.0
				(At 73.0', boulder encountered)		
				(At 75.0', boulder encountered)		
75	26-17			Dark green/grey Silty CLAY with traces of decomposed rock fragments, stiff, saturated (CH) NX Core: 5.0' run, 60% recovery		
80	26-18			Maroon/brown decomposed and partially decomposed ROCK with some Clay, hard, saturated		
84						

Figure 9b - Test Boring Log 26 (Continued)

File R-0102-H1
October 23, 1975

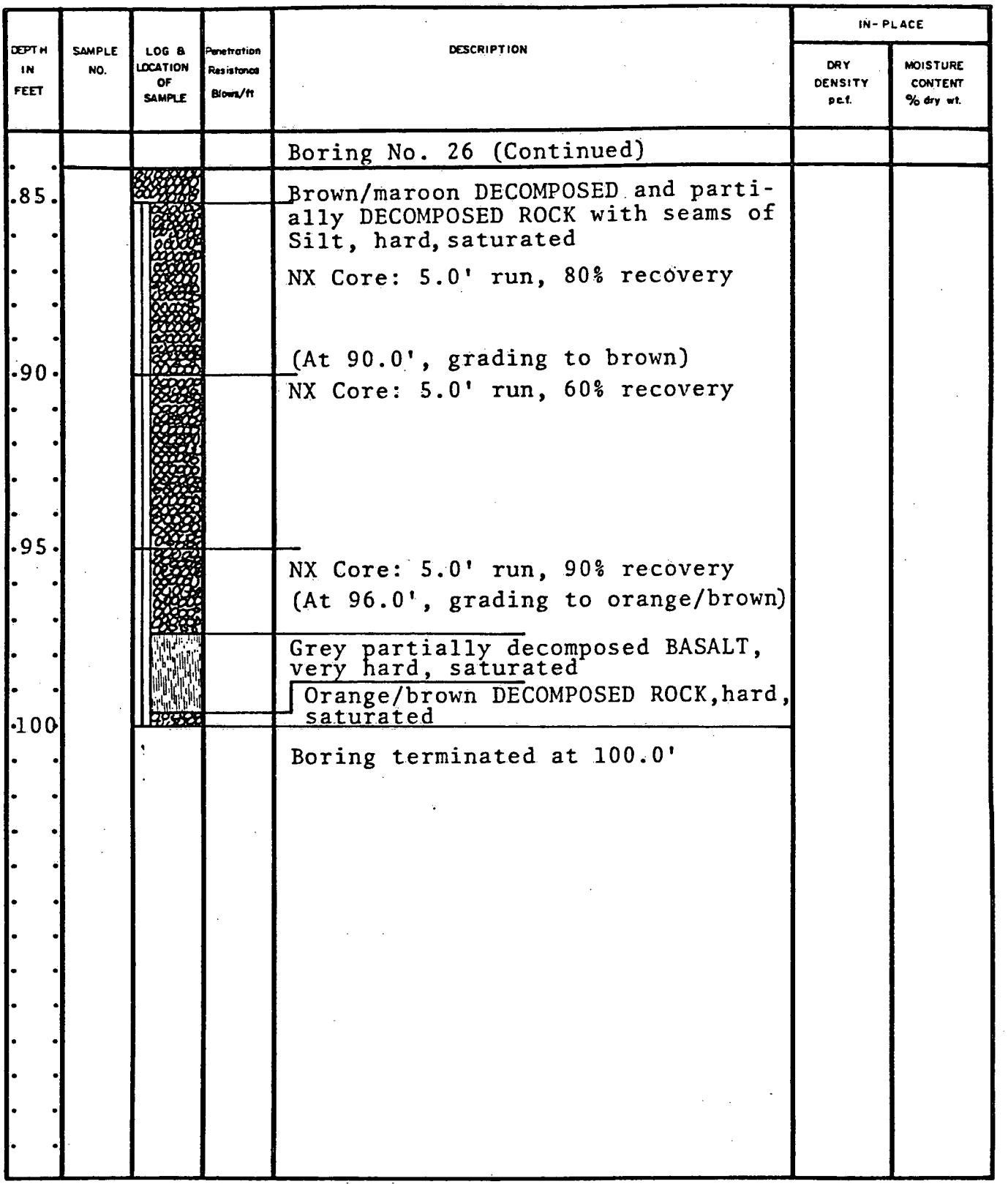

Figure 9c - Test Boring Log 26 (Continued)

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
0				Boring 29		
	29 - 1		22/8"	Tan fine Sandy Silty Coral GRAVEL (Base course), medium dense, damp (GM) Brown/reddish brown Silty CLAY with mottled partially decomposed Gravel and some small boulders, hard, damp (CL-CH) FILL	--	22.2
5	29 - 2		24	Dark grey/brown Silty CLAY with Gravel, organics, and traces of shells and cobbles, very stiff, moist (CH) FILL	101.7	20.4
10	29 - 3		11	Bottom of FILL	50.1	67.6
15	29 - 4		5	Grey/brown Silty CLAY with many small shells, organics and seams of black organic silt/peat, medium stiff, saturated (CH-OH)	46.4	86.4
20	29 - 5		5	Light grey fine Sandy SILT with many Finger Coral fragments, some shells, and Clay binder, soft to medium stiff, saturated (ML)	50.7	62.0
25	29 - 6		4	(At 25.0', grading to loose Finger Coral fragments in a fine Sandy Clayey SILT matrix)	56.8	62.0
28						

Figure 10 - Test Boring Log 29

File R-0102-H1
October 23, 1975

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f.	IN-PLACE MOISTURE CONTENT % dry wt.
28				Boring 29 (Continued)		
30	29 - 7		5	Finger Coral fragments in light grey fine Sandy Clayey SILT matrix, loose, saturated (GC)	72.8	50.0
40	29 - 8		8		65.6	59.1
50	29 - 9		8	Dark grey Silty CLAY with some Sand, stiff, saturated (CH)	71.7	42.7
				Boring terminated at 52.0'		

Figure 10a - Test Boring Log 29 (Continued)

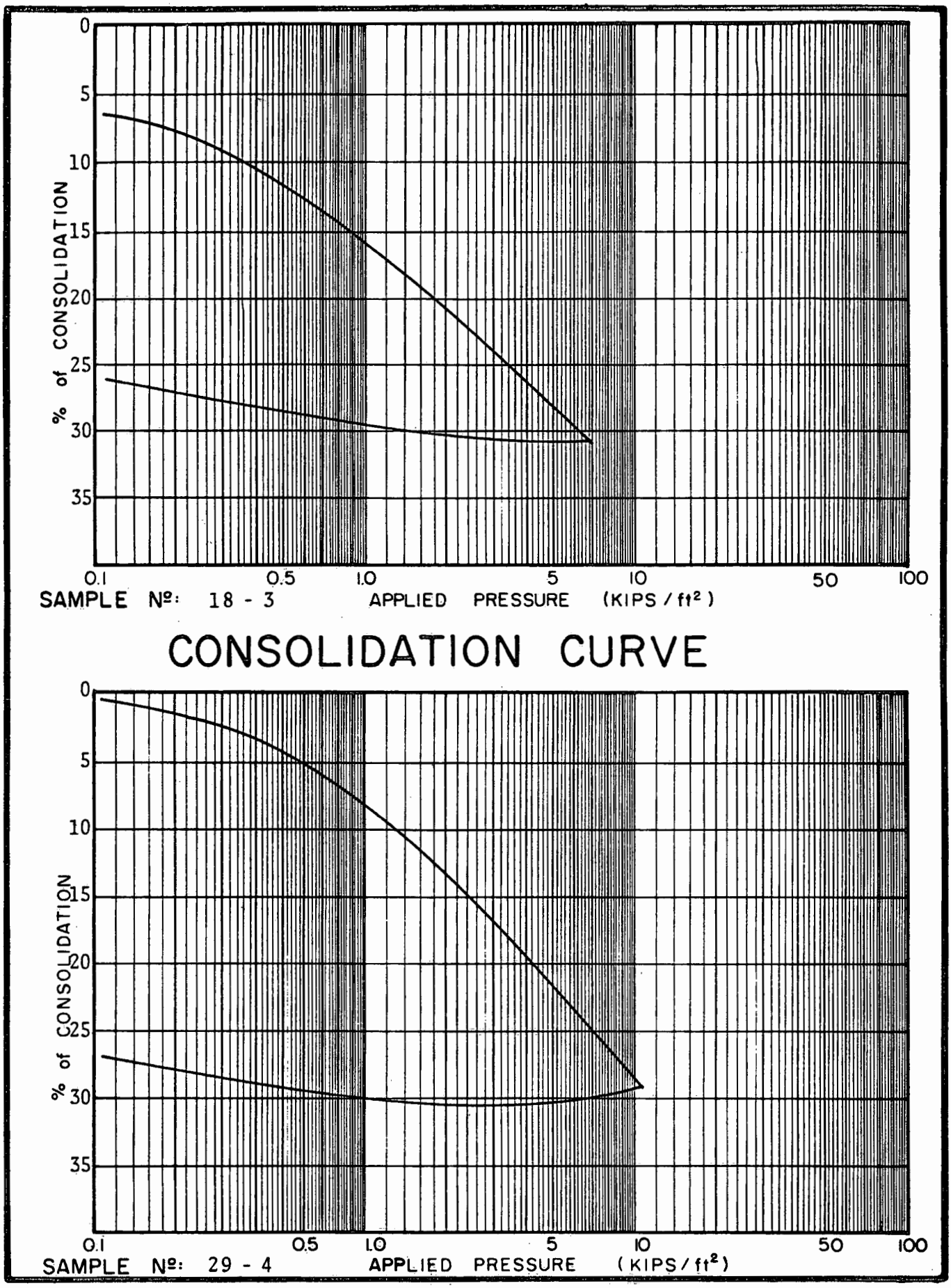

Figure 11 - Consolidation Curves

File R-0102-H1
October 23, 1975

TABLE I

Summary of Laboratory Test Results

Sample No.	Depth ft.	Dry Density p.c.f.	Moisture Content % dry wt.	Torvane p.s.f.	Direct Shear ø	Direct Shear c	Unconfined Strength p.s.f.
3 - 1	21.0	69.2	53.6				
3 - 2	31.0	65.1	59.0	170			
3 - 3	46.5	71.3	44.6	200			
3 - 4	61.5	73.8	48.1		19½°	150	
3 - 5	71.0	50.6	32.2				
16 - 2	51.0	66.1	55.2				
16 - 3	61.0	65.7	64.1	700			
16 - 4	71.0	70.6	55.5	1875			
17 - 2	41.0	72.3	50.0				4370
17 - 3	61.0	67.1	55.2	560			
17 - 4	79.0	58.8	66.9	1050			
18 - 2	31.0	59.4	67.6	270			
18 - 3	41.0	64.6	59.3				
18 - 4	56.0	69.1	56.7				
18 - 5	71.0	65.3	60.5		39°	350	
22 - 1	11.0	52.8	67.6	1750			
22 - 3	62.5	72.7	50.0				4310
22 - 4	71.0	112.0	19.6				
25 - 3	10.5	93.0	21.4	2750			
25 - 14	71.0	69.4	52.3	1350	13° 15½°	730 (peak) 400 (relaxed)	

File R-0102-H1
October 23, 1975

TABLE I (Continued)

Summary of Laboratory Test Results

Sample No.	Depth ft.	Dry Density p.c.f.	Moisture Content % dry wt.	Torvane p.s.f.	Direct Shear ø	Direct Shear c	Unconfined Strength p.s.f.
26 - 2	6.0	84.0	29.6	4000			
26 - 11	46.5	76.1	46.8	750	2°	380	
26 - 13	56.5	71.4	50.6	600	4°	210	
26 - 16	71.0	80.0	41.0	700	14°	350	(peak)
					14°	175	(relaxed)
29 - 1	2.0		22.2	3500			
29 - 2	6.0	101.7	20.2	3000			
29 - 3	11.5	54.8	68.4	1375	20½°	500	
29 - 4	16.0	46.4	86.4	1000	19½°	190	
29 - 5	21.5	50.7	62.0				
29 - 6	26.0	56.8	62.0				
29 - 7	31.9	72.8	50.0				
29 - 8	41.5	65.6	59.1				
29 - 9	51.5	71.7	42.7	750			

File R-0102-H1
October 23, 1975

TABLE II

Summary of Atterberg Limits Test Results

Sample No.	Depth ft.	Description	Liquid Limit %	Plasticity Index %
18 - 1	21.0	Light grey Clay/Silt	58	23
29 - 3	11.5	Grey/brown Silty CLAY with organics (CH)	111	50